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# Agricultural Biotechnology *for* Development







CREDIT: SAHARAH MOON CHAPOTIN/USAID

Through a unique public-private partnership, USAID is supporting the development of insect resistant eggplant varieties in India, where they will be released as royalty-free, open pollinated varieties. Insect damage, primarily by the fruit and shoot borer, can reduce yields up to 50 percent and force farmers to apply heavy amounts of pesticide. These new eggplant varieties will have greater yields and are expected to reduce pesticide usage by up to 80 percent. The same technology has been transferred from India to the Philippines and Bangladesh. Through the combined participation of the commercial and public sector, this partnership is ensuring that the benefits of biotechnology reach resource-poor farmers and consumers.

## Agricultural Productivity Growth through Biotechnology

In many developing countries, especially among the rural poor, economic growth and increased income generating opportunities depend on the performance of the agriculture sector. Over the last 20 years, improved crop varieties have accounted for an estimated half of the improvements in agricultural productivity. Science and technology are key components of the U.S. Agency for International Development (USAID) agriculture strategy.

### Developing New Crop Varieties

Agricultural biotechnology offers an additional tool for increasing crop productivity, especially when conventional methods cannot deliver on breeding targets. USAID's goal is to promote access to the tools of biotechnology by scientists and by smallholder farmers around the world. Improved access will help farmers increase productivity, and reduce economic and social risks due to pest, disease, and natural resource fluctuations and constraints. Some of the crop varieties derived through biotechnology will help improve the environmental quality of agriculture by reducing dependence on chemical pesticides.

USAID supports crop improvement at all stages of the pipeline from laboratory research to field trials to commercialization and delivery of technology, thereby ensuring that research investments lead to new crops in farmers' fields. Parallel investments in our partner countries assist with building effective regulatory systems that ensure appropriate safety measures are taken while moving bioengineered crops through this development pipeline.



RICE, CREDIT: SAHARAH MOON CHAPOTIN/USAID

Increasing populations and stagnant yield gains of major staple crops are driving a need for increased cereal crop productivity on existing cultivated lands. Water scarcity, soil salinity, heat stress and climate change are all factors negatively impacting productivity throughout the developing world. Using marker-assisted breeding and genetic engineering through a variety of public-private partnerships, USAID is supporting the development of new rice and wheat varieties for South Asia and Africa adapted for adverse conditions such as drought, soil and water salinity and extreme temperatures. New cereal varieties with enhanced environmental resilience will help farmers adapt to the expected impacts of climate change while generating more income and conserving resources.



CREDIT: ANDREW KIGGUNDU NATIONAL AGRICULTURAL RESEARCH ORGANIZATION, UGANDA (NARO)

Pests and disease are a constraint to the cultivation of banana, a major food crop for smallholder farmers in Africa, where yield losses sometimes reach 100 percent. Breeding bananas is particularly challenging because most edible bananas are sterile; modern biotechnology methods therefore hold considerable promise. Through an international public sector partnership, USAID supports the development of bananas engineered to resist disease. These bananas are initially being evaluated for efficacy and safety in field trials in Uganda, where crop losses due to diseases are particularly severe.

Biotechnology provides an approach to increasing yields, boosting crop resilience and mitigating global climate change, which is predicted to be especially disruptive in sub-Saharan Africa and South Asia. USAID partner programs are developing new cereal crop varieties that more efficiently utilize soil nitrogen. These crops allow increased yields on poor soils while reducing fossil fuel consumption used in producing synthetic fertilizers as well as reducing emissions of nitrous oxide, a powerful greenhouse gas. USAID partners are also quantifying greenhouse gas emissions in different agricultural systems to identify technologies and management practices that can help farmers mitigate climate change and gain carbon credits for less fertilizer usage.



CREDIT: T. SAHARAH MOON, CHAPOTIN/USAID

## Enabling Policy Environments

### Regulatory Frameworks

Biosafety regulatory frameworks are essential for countries to access and safely deploy the products of modern biotechnology. USAID supports regulatory development and policy analysis in relation to broader economic, food security, environment and trade issues. USAID partnerships aim to strengthen environmental safety and food safety policies, and to build local capacity for the development and implementation of science-based regulations. Enhancing the capacity of regulatory staff to conduct

spill-over. USAID supports African regional organizations such as COMESA and ECOWAS as they lead regional biotechnology policy efforts. Similarly, USAID supports cooperative policy dialogs and capacity building with regional Asian forums such as APEC and ASEAN.

### Intellectual Property Management and Technology Transfer

The public sector in developing countries often lacks the institutional capacity to acquire the intellectual property (IP) rights needed to conduct research and develop new crops, as well as to promote transfer of technology to the local private sector for commercialization. Through organizations such as the AATF and U.S. universities, USAID partners assist developing country researchers to access proprietary technology. Insect resistant eggplant and cowpea, disease resistant cassava, and rice that uses less fertilizer are just a few of the products under development through royalty-free licensing agreements between private companies and developing country research institutions.



CREDIT: LARRY BEACH/USAID

**Dr. Ishiaku of the Institute of Agricultural Research in Zaria, Nigeria explains his cowpea research**

science-based risk assessments and monitor compliance with biosafety regulations is an important part of establishing fully functional regulatory frameworks in countries that may want to commercialize bioengineered crops or import biotech commodities.

### Regional Approaches

Regional policy cooperation promotes the exchange of experience among neighboring countries, harmonization of regulations, facilitation of trade, and technology

## Public Private Partnerships

The African Agricultural Technology Foundation (AATF) facilitates public - private partnerships to access proprietary technology and to ensure the delivery of technology through the local private sector. AATF's management of these linkages upstream and downstream of public research has assisted the delivery of new maize varieties in Kenya that are resistant to the devastating parasitic weed striga, and has established international partnerships to develop insect-resistant cowpea and nitrogen-use efficient rice.

## Communications

Farmer associations, seed companies, policy makers, and the public all have a stake in decisions regarding biotechnology, and good communication is essential to ensure stakeholder participation in the development of policies and the adoption of new technologies. With USAID's support, local organizations conduct outreach activities to ensure that stakeholders have the necessary resources to make informed decisions about biotechnology.



DR. P. GOVILA CONDUCTING TRAINING ON CONFINED FIELD TRIALS  
CREDIT: SOUTH ASIA BIOSAFETY PROGRAM (SABP)



• A woman sells produce at a market in India, Credit: (c) 2000 Todd Shapera/Courtesy of Photoshare • A farmer uses a carabao and wooden plow on his maize field in Ilocos Sur, Philippines, Credit: (c) 2006 Freddie Lazaro/Courtesy of Photoshare • Farmers grow rice during the rainy season in West Bengal, India, Credit: (c) 2006 Sandipan Majumdar/Courtesy of Photoshare • A young mother in Tanzania tends a potato garden, Credit: (c) 2006 Geoffrey Cowley/Courtesy of Photoshare

• Water buffalo and rice fields in the Philippines, Credit: Ariel Javellana/International Rice Research Institute • Maize plant in field, Credit: LLC/Vstock • Virus resistant papayas are evaluated in a greenhouse in the Philippines, Credit: Larry Beach/USAID



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